AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): An instantaneous voltage dip detection device comprising:

phase shifting means for shifting a supply voltage waveform by a predetermined angle and generating a phase shift voltage waveform;

phase lock means for detecting the zero voltage phase of the supply voltage waveform;

supply voltage waveform threshold generating means for generating a supply voltage waveform threshold acting as a voltage dip determination reference with respect to said supply voltage waveform in synchronization with said phase lock means ;

phase shift voltage waveform threshold generating means for generating a phase shift voltage waveform threshold acting as a voltage dip determination reference with respect to said phase shift voltage waveform;

determination region setting means for setting a part or all of absolute values of said supply voltage waveform threshold and phase shift voltage waveform threshold that are larger than a predetermined value as ~~being a~~ comparative determination effective region;

supply voltage waveform comparing means for outputting a voltage dip detection signal based on the comparison between said supply voltage waveform and the supply voltage waveform threshold, in ~~the case where said determination region setting means determines as being~~ a comparative determination effective region of the supply voltage waveform; and

phase shift voltage waveform comparing means for outputting a voltage dip detection signal based on the comparison between said phase shift voltage waveform and the phase shift voltage waveform threshold, ~~in the case where said determination region setting means determines as being~~ in a comparative determination effective region of the phase shift voltage waveform.

2. (original): The instantaneous voltage dip detection device according to claim 1, wherein said phase shift voltage waveform is a waveform shifted from the zero voltage phase of the supply voltage waveform by 90 °.

3. (previously presented): The instantaneous voltage dip detection device according to claim 1 further comprising second phase lock means that detects the zero voltage phase of the supply voltage waveform, wherein said phase shift voltage waveform threshold generating means generates, in synchronization with said second phase lock means, a phase shift voltage waveform threshold serving as a voltage dip determination reference with respect to a phase shift voltage waveform.

4. (previously presented): The instantaneous voltage dip detection device according to claim 2 further comprising second phase lock means that detects the zero voltage phase of the supply voltage waveform, wherein said phase shift voltage waveform threshold generating means generates, in synchronization with second phase lock means, a phase shift voltage waveform threshold serving as a voltage dip determination reference with respect to a phase shift voltage waveform.

5. (previously presented): The instantaneous voltage dip detection device according to claim 1 further comprising phase difference detection means that detects the zero voltage phase of the supply voltage waveform and obtains a phase difference from the zero voltage phase of the supply voltage waveform obtained from said phase lock means, wherein said phase shift voltage waveform threshold generating means generates, in synchronization with said phase difference detection means, a phase shift voltage waveform threshold serving as a voltage dip determination reference with respect to a phase shift voltage waveform.

6. (previously presented): The instantaneous voltage dip detection device according to claim 2 further comprising phase difference detection means that detects the zero voltage phase

of the supply voltage waveform and obtains a phase difference from the zero voltage phase of the supply voltage waveform obtained from said phase lock means, wherein said phase shift voltage waveform threshold generating means generates, in synchronization with said phase difference detection means, a phase shift voltage waveform threshold serving as a voltage dip determination reference with respect to a phase shift voltage waveform.

7. (previously presented): The instantaneous voltage dip detection device according to claim 1, wherein said supply voltage waveform comparing means and the phase shift voltage waveform comparing means include a counter function, and utilizing said counter function, a voltage dip detection signal is generated only in the case where it is determined that a voltage dip occurs continuously for a predetermined time period.

8. (previously presented): The instantaneous voltage dip detection device according to claim 2, wherein said supply voltage waveform comparing means and the phase shift voltage waveform comparing means include a counter function, and utilizing said counter function, a voltage dip detection signal is generated only in the case where it is determined that a voltage dip occurs continuously for a predetermined time period.

9. (previously presented): The instantaneous voltage dip detection device according to claim 3, wherein said supply voltage waveform comparing means and the phase shift voltage waveform comparing means include a counter function, and utilizing said counter function, a voltage dip detection a signal is generated only in the case where it is determined that a voltage dip occurs continuously for a predetermined time period.

10. (previously presented): The instantaneous voltage dip detection device according to claim 4, wherein said supply voltage waveform comparing means and the phase shift voltage waveform comparing means include a counter function, and utilizing said counter function, a

voltage dip detection signal is generated only in the case where it is determined that a voltage dip occurs continuously for a predetermined time period.

11. (previously presented): The instantaneous voltage dip detection device according to claim 5, wherein said supply voltage waveform comparing means and the phase shift voltage waveform comparing means include a counter function, and utilizing said counter function, a voltage dip detection signal is generated only in the case where it is determined that a voltage dip occurs continuously for a predetermined time period.

12. (previously presented): The instantaneous voltage dip detection device according to claim 6, wherein said supply voltage waveform comparing means and the phase shift voltage waveform comparing means include a counter function, and utilizing said counter function, a voltage dip detection signal is generated only in the case where it is determined that a voltage dip occurs continuously for a predetermined time period.

13. (currently amended): An instantaneous voltage dip detection device comprising:

phase shifting means for shifting a supply voltage waveform by a predetermined angle and generating a phase shift voltage waveform;

phase lock means for detecting the zero voltage phase of the supply voltage waveform;

supply voltage waveform threshold generating means for generating a supply voltage waveform threshold acting as a voltage dip determination reference with respect to said supply voltage waveform in synchronization with said phase lock means;

phase shift voltage waveform threshold generating means for generating a phase shift voltage waveform threshold acting as a voltage dip determination reference with respect to said phase shift voltage waveform;

determination region setting means for setting a part or all of absolute values of said supply voltage waveform threshold and phase shift voltage waveform threshold that are larger than a predetermined value as being a comparative determination effective region;

supply voltage waveform comparing means for outputting a voltage dip detection signal based on the comparison between said supply voltage waveform and the supply voltage waveform threshold, ~~in the case where said determination region setting means determines as being~~ a comparative determination effective region of the supply voltage waveform; and

phase shift voltage waveform comparing means for outputting a voltage dip detection signal based on the comparison between said phase shift voltage waveform and the phase shift voltage waveform threshold, in ~~the case where said determination region setting means determines as being~~ a comparative determination effective region of the phase shift voltage waveform;

wherein said phase shift means is an all-pass filter consisting of resistors, capacitor and amplifier, and a circuit constant value $1/(2\pi CR)$ for carrying out phase shift operation is set to be within a range of 8 to 340.

14. (currently amended): The instantaneous voltage dip detection device according to claim 13 further comprising phase difference detection means for detecting the zero voltage phase of said phase shift voltage waveform and obtaining a phase difference from the zero voltage phase of the supply voltage waveform obtained from said phase lock means;

wherein said phase difference detection means has a recording function for preliminarily recording the zero voltage phase of the phase shift voltage waveform at ~~the normal~~ time when no harmonics are superimposed on the supply voltage, and a harmonics level determination function for determining a level of harmonics based on a phase shift quantity ~~being a difference~~ between the zero voltage phase of the phase shift voltage waveform on which harmonics are superimposed and ~~the~~said zero voltage phase of the phase shift voltage waveform at the normal time recorded by said recording means; and by a command of the harmonics level determination function, the phase shift voltage waveform threshold generating means generates a threshold conforming to a level of the harmonics.

15. (currently amended): The instantaneous voltage dip detection device according to claim 13, wherein said power supply waveform threshold generating means and the phase shift

voltage waveform threshold generating means have a waveform recording function to obtain an upper limit threshold and a lower limit threshold by a predetermined calculation based on recorded waveforms; said supply voltage waveform comparing means makes a comparison between said supply voltage waveform and the supply voltage waveform threshold at a predetermined phase and outputs a voltage dip detection signal when ~~being~~the supply voltage waveform is smaller than the lower limit threshold on the positive side of the phase and when ~~being~~ it is larger than the upper limit threshold on the negative side of the phase; and phase shift voltage waveform comparing means makes a comparison between said phase shift voltage waveform and the phase shift voltage waveform threshold at a predetermined phase and outputs a voltage dip detection signal when ~~being~~the phase shift voltage waveform is smaller than the lower limit threshold or larger than the upper limit threshold on the positive side of the phase, and when ~~being~~it is larger than the lower limit threshold or smaller than the upper limit threshold on the negative side of the phase ~~on the negative side of the phase~~.

16. (currently amended): The instantaneous voltage dip detection device according to claim 13, wherein said phase shift voltage waveform threshold generating means ~~establishes~~ also establishes a voltage rising determination reference value with respect to a phase shift voltage waveform as a threshold at a predetermined phase; and said supply voltage waveform comparing means makes a comparison between said phase shift voltage waveform and a voltage dip determination reference threshold of the phase shift voltage waveform in ~~the case where said determination region setting means determines as being a~~said comparative determination effective region of the phase shift voltage waveform, outputs a voltage dip detection signal when ~~being~~the phase shift voltage waveform is smaller on the positive side of the phase and when ~~being~~it is larger on the negative side of the phase; and in said predetermined phase, said supply voltage waveform comparing means makes a comparison between said phase shift voltage waveform and the voltage rising determination reference threshold, and outputs a voltage dip detection signal when ~~being~~the phase shift voltage waveform is larger on the positive side of the phase and when ~~being~~it is smaller on the negative side of the phase.

17. (currently amended): The instantaneous voltage dip detection device according to claim 13, wherein said phase shift voltage waveform threshold generating means has a recording function to record sequentially the phase shift voltage waveform, establishes a voltage dip determination reference value with respect to said phase shift voltage waveform and a voltage rising determination reference value obtained by adding a predetermined value to a recorded waveform of an instantaneous value of the phase shift voltage waveform at a predetermined phase as a threshold; said supply voltage waveform comparing means makes a comparison between said phase shift voltage waveform and a voltage dip determination reference threshold of the phase shift voltage waveform in ~~the case where said determination region setting means determines as being a~~said comparative determination effective region of the phase shift voltage waveform, outputs a voltage dip detection signal when ~~being~~the phase shift voltage waveform is smaller on the positive side of the phase and when ~~being~~the phase shift voltage waveform is larger on the negative side of the phase; and in said predetermined phase, said supply voltage waveform comparing means makes a comparison between said phase shift voltage waveform and the voltage rising determination reference threshold, and outputs a voltage dip detection signal when being larger on the positive side of the phase and when ~~being~~it is smaller on the negative side of the phase.

18. (currently amended): An instantaneous voltage dip detection device comprising:

phase lock means for detecting the zero voltage phase of the supply voltage waveform;

supply voltage waveform threshold generating means for generating a supply voltage waveform threshold acting as a voltage dip determination reference with respect to said supply voltage waveform in synchronization with said phase lock means ;

waveform recording means for recording sequentially supply voltage waveforms in synchronization with said phase lock means;

recorded waveform threshold generating means for generating a lower limit threshold or an upper limit threshold by a predetermined calculation based on said recorded waveforms;

determination region setting means for setting ~~a~~ comparative determination effective region in synchronization with said phase lock means;

supply voltage waveform comparing means for outputting a voltage dip detection signal based on the comparison between said supply voltage waveform and the supply voltage waveform threshold, in ~~the case where said determination region setting means determines as being~~ a comparative determination effective region of the supply voltage waveform;

recorded waveform comparing means for outputting a voltage dip detection signal based on the comparison between said supply voltage waveform and the recorded waveform threshold, in ~~the case where said determination region setting means determines as being a~~ comparative determination effective region of the recorded waveform;

continuity determination means for determining that said supply voltage waveform comparing means outputs the voltage dip detection signal continuously for a predetermined time period;

logical multiplication (AND) means between an output of said supply voltage waveform comparing means and an output of said recorded waveform comparing means ; and

voltage dip detection output means for outputting a voltage dip detection output by logical addition (OR) between an output of said logical multiplication(AND) means and an output of said continuity determination means .

19. (currently amended): The instantaneous voltage dip detection device according to claim 18 further comprising: waveform integrating means for integrating a predetermined calculation value of the supply voltage waveform in synchronization with the phase lock means; integrated threshold generating means for generating, in synchronization with said phase lock means, a supply voltage integration threshold serving as a voltage dip determination reference with respect to a supply voltage integrated value; integrated value comparing means for outputting a voltage dip signal based on a comparison between said supply voltage waveform integrated value and the integrated threshold in ~~the case that said determination region setting means has determined~~ a comparative determination effective region of the waveform integrated value; logical addition (OR) means between an output of said supply voltage waveform comparing means and an output of said integrated value comparing means ; and logical

multiplication (AND) means between an output of said logical addition (OR) means and an output of said recorded waveform comparing means ; wherein an input of said logical multiplication (AND) means is any of an output of said recorded waveform comparing means , an output of said supply voltage waveform comparing means , or an output of said integrated value comparing means.